



## FOSTERING ENVIRONMENTAL LITERACY THROUGH CREATIVE DRAMA IN PRIMARY SCIENCE EDUCATION

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### Introduction

Efforts to foster environmental literacy in primary science classrooms often rely on the transmission of environmental knowledge, yet such approaches may not be sufficient to support young students in developing meaningful connections with environmental issues. In the context of classroom-based environmental education, there remains a need for pedagogical practices that engage students not only cognitively but also emotionally and socially. From this perspective, experiential and participatory approaches such as creative drama may offer opportunities for students to explore environmental issues through active involvement and perspective-taking. Environmental problems such as climate change, biodiversity loss, and the depletion of natural resources are increasingly recognized as multidimensional global crises requiring social, economic, and cultural transformation (Syafitri et al., 2021). In this context, developing individuals' environmental knowledge, awareness, attitudes, and responsible behaviors is considered essential for a sustainable future (Reid et al., 2021). This comprehensive set of competencies is conceptualized in the literature as environmental literacy, referring to individuals' capacity to understand environmental systems, recognize environmental problems, think critically about these issues, and act responsibly. As a multidimensional learning outcome encompassing cognitive, affective, and behavioral components, environmental literacy requires pedagogical approaches that extend beyond curriculum-based teacher-led education and engage learners' experiences, values, and meaning-making processes (Gough, 2006).

Primary science education provides a key pedagogical context for fostering environmental literacy, as environmental and sustainability-related topics are systematically addressed during the primary school years. This period represents a critical developmental stage in which students form foundational understandings of nature, environmental problems, and human-environment interactions (Nche et al., 2019; Peterková et al., 2025). Early learning experiences have been shown to influence students' later environmental attitudes and behaviors (Ballantyne et al., 2006). However, given the developmental characteristics of this age group, abstract environmental concepts may remain limited when taught solely through lecture-based approaches. Accordingly, how environmental education is structured becomes as important as what is taught. Learner-centered pedagogies that promote

**Abstract.** *Environmental literacy is a multidimensional learning process that includes environmental knowledge, attitudes, values, awareness, responsibility, and intentions to take environmental action. However, primary environmental education often remains limited to cognitive outcomes and may not sufficiently foster affective engagement or ecological responsibility. This study examined the potential of creative drama as a transformative pedagogy for enhancing third-grade students' environmental literacy in primary science education. An explanatory sequential mixed-methods design was employed. The quantitative phase used a quasi-experimental pre-test-post-test control group design ( $n = 60$ ; experimental = 30, control = 30), followed by a qualitative case study with 12 students from the experimental group. Quantitative data were collected using the Environmental Literacy Scale for Children and analyzed using ANCOVA (controlling for pre-test scores) and paired-samples  $t$  tests. Qualitative data were obtained through semi-structured interviews and analyzed using thematic analysis. Results indicated significant improvements in environmental literacy, particularly in environmental attitudes and pro-environmental behavioral intentions. Students also reported increased empathy, collaboration, imaginative engagement with environmental problems, and critical reflection on ecological responsibility. Overall, creative drama appears to be a promising transformative approach for environmental literacy in primary science education.*

**Keywords:** *creative drama, environmental literacy, primary school students, primary science education*

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active participation and integrate affective and cognitive processes tend to produce more meaningful outcomes in developing environmental literacy (Matsekoleng & Msezane, 2022). Among these approaches, creative drama has gained increasing attention as an experiential pedagogical tool that engages students through improvisation, role-taking, and enactment (Freeman et al., 2014; Heikkinen, 2016).

Creative drama functions not merely as a teaching technique but as an educational process through which students construct meaning from lived experiences, integrating emotional and cognitive engagement (Heathcote et al., 1984). In environmental education, this approach enables students to explore environmental issues through multiple perspectives, fostering empathy, value reflection, and responsible action (Davis & Elliot, 2014; McCaslin, 2006; Toivanen et al., 2011). Drama activities create opportunities for students to reflect on their assumptions and reconsider their relationship with environmental issues (Wooland, 2014). These features resonate with Mezirow's Transformative Learning Theory, which conceptualizes learning as a process of critically examining existing assumptions and developing more inclusive meaning perspectives (Mezirow, 1997; O'Sullivan, 1999; Taylor, 2015). Within this framework, creative drama can be understood as a pedagogical approach with the potential to support deeper meaning-making processes and contribute to the development of environmental literacy.

## Literature Review

### *Environmental Literacy in the Context of Primary Science Education*

Environmental literacy is widely conceptualized as a multidimensional construct that extends beyond environmental knowledge to include attitudes, values, critical thinking, and environmentally responsible behaviors (Morrone et al., 2001). Research has shown that environmentally literate individuals not only understand ecological systems but are also able to evaluate environmental issues, make informed decisions, and engage in responsible action (Cheng & Wu, 2015; Yavetz et al., 2009). Accordingly, environmental literacy is regarded as a holistic learning outcome integrating cognitive, affective, and behavioral dimensions (McBride et al., 2013; Szczytko et al., 2019). The primary school years constitute a critical period for the development of environmental literacy, as children begin to construct foundational understandings of the human–nature relationship and form early environmental value orientations (Ceylan & Peker, 2024). Research has shown that learning experiences at this stage can exert long-term influences on students' environmental awareness, attitudes, and responsibility (Berk, 2015; Trawick-Smith, 2018). Systematic reviews further indicate that programs for younger learners are more effective when they combine conceptual understanding with emotional engagement and personal meaning-making (Ardoin & Bowers, 2020). Within this framework, primary science education provides an important pedagogical context for fostering environmental literacy (Gülersoy & Aydemir, 2024). However, school-based environmental and sustainability education often prioritizes conceptual learning, while affective and action-oriented dimensions receive comparatively less emphasis (Guerrero & Sjöström, 2024).

Empirical findings indicate that environmental knowledge alone does not necessarily translate into positive attitudes or responsible behaviors (Ritchie et al., 2008). This suggests that science education, while strong in supporting cognitive outcomes, may not sufficiently foster deeper meaning-making processes required for sustained environmental responsibility. Recent literature therefore emphasizes the importance of pedagogical approaches that integrate experiential, participatory, and reflective learning processes to address the full spectrum of environmental literacy (Jack & Lin, 2017; Matthews, 2004). Accordingly, there is a need to explore instructional approaches that help students make meaning of environmental problems, connect these issues to their own lives, and develop a sense of environmental responsibility (Corredor et al., 2014).

### *Pedagogical Approaches to Environmental Education: Moving Beyond Cognitive Learning Toward Transformative Learning*

Early research in environmental education primarily focused on developing students' environmental knowledge and basic conceptual understanding (Akinoğlu & Sarı, 2009; Şimşekli, 2004). Within science education, this emphasis supported linking environmental topics with scientific content and helping students construct explanations about ecosystems and human–environment interactions (Karamustafaoğlu et al., 2011). However, subsequent findings indicating that environmental knowledge alone does not necessarily translate into attitudes or responsible behaviors have broadened discussions about the scope of pedagogical approaches in environmental education (Artun & Okur, 2015). Recent literature emphasizes that environmental education should be considered not only in terms of

content but also in terms of how learning processes are structured and how students relate these processes to their own experiences. Studies addressing environmental literacy as a multidimensional outcome suggest that cognitive gains become more meaningful when combined with affective engagement and value-oriented learning processes (Smith-Sebasto & Semrau, 2010). Accordingly, there is increasing emphasis on designing environmental education practices that support students' personal meaning-making, empathy, and sense of environmental responsibility.

Interest in experiential and participatory pedagogical approaches in environmental education has increased, as these approaches emphasize active student involvement and learning through lived experience (Erdoğan, 2011). Such practices enable environmental issues to be addressed not only as abstract content but as experiences connected to students' own lives. Systematic reviews indicate that environmental education programs for younger learners are more effective when they support emotional engagement and strengthen students' connections with the environment (Ardoin & Bowers, 2020). These findings suggest that pedagogical approaches play a decisive role in shaping the quality of environmental literacy. In recent years, environmental education research has increasingly examined pedagogical processes through the lens of transformative learning (Akpınar, 2010). This perspective highlights the importance of learning environments that encourage students to question their assumptions and reflect on their relationship with the environment. However, the literature indicates that explanations of how transformative learning-oriented pedagogies are structured at the primary school level remain relatively limited (Uyanık, 2016). Further research is therefore needed to examine which pedagogical tools support students' environmental meaning-making processes and how these processes contribute to the development of environmental literacy.

#### *Creative Drama as an Experiential Pedagogical Approach in Environmental and Science Education*

Creative drama is defined as an experiential pedagogical approach in which students actively engage in learning through improvisation, role-taking, and enactment (Adigüzel, 2006). Rather than positioning learners as passive recipients of information, drama-based pedagogies frame learning as a holistic process involving cognitive, affective, social, and embodied dimensions (Heikkinen, 2016; Toivanen et al., 2011). In environmental education contexts, creative drama enables students to approach environmental issues not as abstract content but as lived situations that can be explored through specific roles and perspectives. Through role-taking and enactment, students encounter environmental problems from multiple viewpoints, which relates closely to the central aims of environmental education, such as fostering empathy, questioning values, and reflecting on environmental responsibility. Research further indicates that learning environments supporting emotional engagement hold strong potential for strengthening the affective and behavioral components of environmental literacy (Aydın & Aykaç, 2016; Özdemir et al., 2009).

Within science education, creative drama functions as a pedagogical tool that connects scientific concepts with students' lived experiences. Drama-based activities allow students to interpret scientific ideas not only through formal explanations but also within meaningful contexts and problem situations (Özek, 2016). This is particularly valuable at the primary level, where abstract concepts may otherwise remain distant. Studies suggest that drama-based approaches can enhance participation and make science learning more meaningful and engaging (Ødegaard, 2003). However, much of the existing research has focused primarily on quantitative outcomes such as environmental knowledge or attitudes (Sunasee et al., 2012), while offering more limited insight into students' meaning-making processes and potential transformative experiences. Moreover, literature often lacks detailed discussion of how drama interventions are structured pedagogically and how these structures relate to different dimensions of environmental literacy. Although creative drama is increasingly associated with deeper learning and perspective-taking (Sezerel & Özoğuz, 2019), questions remain regarding how its role in fostering environmental literacy at the primary school level can be theoretically framed and pedagogically explained. In this regard, connecting creative drama with transformative learning perspectives becomes important for clarifying how drama-based experiences may contribute to deeper changes in students' ways of thinking about and making meaning of the environment.

#### *Transformative Learning Theory and Environmental Education*

One theoretical perspective that has gained increasing attention in environmental education is transformative learning, which conceptualizes learning as a process through which individuals question and reconstruct their existing meaning frameworks (Çimen & Yılmaz, 2014). This perspective emphasizes that learning involves not only acquiring information but also reinterpreting experiences and developing new ways of understanding and acting in the world. In this respect, transformative learning aligns with the value-oriented, responsibility-oriented,

and action-oriented dimensions required for environmental literacy (Brock, 2010). It highlights the role of critical reflection in enabling individuals to reconsider previously unexamined assumptions and develop more inclusive perspectives. Within environmental education, this framework allows environmental problems to be addressed not merely as external phenomena but as issues connected to students' own lives, values, and responsibilities (Donmuş & Pepeler, 2016; Feinstein, 2004). Consequently, transformative learning expands environmental literacy from knowledge-centered competency to a process that supports learners in rethinking their relationship with the environment.

In science and environmental education literature, transformative learning is often discussed in relation to the complex and value-laden nature of environmental issues. Topics such as climate change and sustainability require students not only to understand scientific explanations but also to reflect on their ethical and personal implications. From this perspective, transformative learning provides a meaningful framework for interpreting pedagogical processes that encourage students to question existing assumptions and develop more inclusive viewpoints (McGonigal, 2005). However, the literature indicates that transformative learning has been addressed predominantly in adult or higher education contexts, and its application to primary school settings remains relatively underexplored (Merriam, 2004). Questions regarding how transformation occurs in younger learners and how it is reflected in different dimensions of environmental literacy require further clarification through concrete pedagogical examples and analyses of learning processes. Pedagogical approaches that promote active participation, experiential learning, and critical reflection are therefore particularly important for structuring transformative learning processes at the primary school level. Transformative learning theory offers a framework for examining not only whether environmental literacy-oriented pedagogies are effective, but also how they generate change and through which learning processes these changes occur. Despite growing interest in environmental literacy and drama-based pedagogies, empirical studies at the primary level that examine both learning outcomes and students' meaning-making processes remain limited. Accordingly, research integrating quantitative findings with qualitative insights is needed to better understand how transformative pedagogical approaches operate within primary science education contexts.

#### *Research Aim and Research Question*

This study was designed to explore how a creative drama-based environmental education process influences third-grade students' environmental literacy and how students interpret their experiences during this learning process. Rather than focusing solely on score-based outcomes, the study also considers how students engage with environmental issues in the classroom, how they make sense of these experiences, and whether participation in drama activities is associated with shifts in their ways of thinking about the environment. From a transformative learning perspective, particular attention is given to how role-taking, enactment, and reflection may contribute to the development of new or more inclusive meaning perspectives. Within the context of primary science education, the study therefore examines how creative drama functions as a classroom-based pedagogical approach that may support the development of environmental literacy across cognitive, affective, and experiential dimensions. To address this aim, the research was guided by the following questions:

- 1) To what extent did participation in the creative drama-based environmental education intervention affect the environmental literacy levels of students in the experimental group between pre-test and post-test?
- 2) To what extent did the creative drama-based environmental education intervention lead to differences in post-test environmental literacy levels between students in the experimental group and those in the control group who received curriculum-based instruction?
- 3) How did students in the experimental group experience the creative drama-based environmental education process, and how did these experiences relate to changes in their environmental literacy and ways of thinking about environmental issues?



## Research Methodology

### *General Background*

In this study, an explanatory sequential mixed-methods design was employed. In mixed-methods research, integrating qualitative and quantitative approaches may provide a more comprehensive understanding of the research problem than relying on either approach alone. In an explanatory sequential design, quantitative data are collected and analyzed first, followed by the collection of qualitative data. The quantitative and qualitative findings were analyzed separately and, where appropriate, brought together in the discussion section (Creswell, 2008). In this study, a mixed-methods approach was adopted to evaluate the potential of creative drama as a transformative pedagogical approach for enhancing primary school students' environmental literacy. Because quantitative data were collected and analyzed first, followed by qualitative data to further explain these results, an explanatory sequential design was considered appropriate at the level of elementary school intervention research. The intervention was implemented during the fall semester of the 2025–2026 academic year over a six-week period within the regular science course schedule, with two class sessions per week. Pre-test data were collected one week prior to the intervention, and post-test data were collected immediately after its completion.

### *Participants*

The study was conducted with third-grade students attending a public primary school in Ordu, Türkiye. The selected school was considered to be close to the overall educational average of the city center. Since the classroom teacher responsible for both Class A and Class B voluntarily agreed to implement the study, Class A was assigned as the experimental group and Class B as the control group through a random draw. Based on the classroom teacher's information, groups of 30 students were formed from those who regularly attended classes in both classrooms. The experimental group consisted of 17 girls (56.7%) and 13 boys (43.3%), whereas the control group included 16 girls (53.3%) and 14 boys (46.7%). To determine whether the two groups were comparable at baseline, pre-tests were administered using the data collection instruments, and the groups were found to be statistically equivalent (Table 2).

### *Instruments*

#### Environmental Literacy Scale for Children

The Environmental Literacy Scale for Children, developed by Tabaru Örnek and Yel (2024), is a 5-point Likert-type instrument consisting of 17 items and three subscales. The Political Behavior subscale includes 6 items, the Consumer and Persuasion Behavior subscale includes 7 items, and the Eco-Management subscale includes 4 items. Cronbach's alpha reliability coefficients were reported as .81 for Political Behavior, .75 for Consumer and Persuasion Behavior, .78 for Eco-Management, and .84 for the overall scale.

#### Semi-Structured Interview Form

A semi-structured interview form developed by the researcher was used to obtain participants' views and experiences directly and in their own words (Glesne, 2015). Prior to developing the interview form, the relevant literature was reviewed, and an initial pool of 16 questions was generated. Among these, 12 questions were selected as they were considered capable of addressing the research questions, and a draft interview form was prepared. The draft form was then sent to a primary school teacher, a faculty member with a PhD in primary education, and a language expert to obtain expert feedback. Based on the feedback received, the semi-structured interview form was finalized with 10 questions. Sample items from the semi-structured interview form are provided in Appendix A.

### *Educational Materials and Procedure*

Following the approval of the ethics committee, the implementation phase of the study was carried out over an eight-week period during the Fall semester of the 2025–2026 academic year. The drama sessions used in the intervention were developed by the researcher and finalized based on expert feedback obtained from two



independent researchers holding doctoral degrees in drama education. The drama sessions were implemented by the classroom teacher. To support treatment fidelity and ensure consistency across sessions, the teacher followed the structured session plans developed for the intervention. The first and last weeks of the intervention were allocated to the administration of the pre-tests and post-tests, respectively. During the intervening six weeks, the educational activities were conducted for two class hours per week. The environmental literacy-themed drama sessions are presented in Table 1.

**Table 1***Environmental Literacy-Themed Drama Sessions*

Week	Subject	Learning Outcomes
First Week	The Environment and Me	-Recognizes the local environment. -Develops awareness of environmental consciousness
Second Week	The Journey of Water	-Recognizes that natural resources can be depleted. -Understands the importance of conserving clean water.
Third Week	Waste and Recycling	-Understands the relationship between waste and recycling. -Identify materials that can be recycled.
Fourth Week	Ecosystems and Biodiversity	-Understands the importance of ecosystems for living organisms. -Recognizes the importance of biodiversity for ecosystems.
Fifth Week	Environmental Responsibility and Community	-Understands the importance of environmental responsibility. -Explains the importance of being environmentally responsible as a community.
Sixth Week	Ecological Action and Solidarity	-Develops an ecological action plan to promote environmental literacy. -Understands the importance of collaborating with others to implement an ecological action plan.

The lesson plans developed for the experimental and control groups were designed to guide teachers throughout the implementation process, ensure educational consistency across groups, and support treatment fidelity. In preparing the lesson plans, an approach was adopted that emphasized systematically structuring education and designing activities aligned with the intended learning outcomes. Accordingly, relevant educational design principles were taken into consideration during the development process. While preparing the lesson plans, environment-related learning outcomes included in the primary science curriculum served as the basis. In this context, a literature review was first conducted to examine lesson plans developed in the fields of environmental education, creative drama, and primary science education. Based on this review, creative drama-based lesson plans were developed for the experimental group to support environmental literacy. In designing the lesson plans for the experimental group, particular emphasis was placed on improvisation, role-taking, and enactment activities that encouraged active student participation, and drama contexts that enabled environmental issues to be explored from multiple perspectives were integrated into the plans. The control group covered the same curriculum topics during the same eight-week period and within the same weekly time allocation. Instruction in the control group followed the standard primary science curriculum and textbook activities. Lessons were structured around teacher-led explanations, textbook-based discussions, question–answer sessions, and short individual or group exercises. No drama-based or role-playing activities were included in the control group. While regular classroom discussions and textbook-based activities took place, the lessons did not explicitly incorporate structured experiential or reflective components comparable to those in the experimental group.

### *Data Analysis*

First, descriptive statistics were computed, and the pre-test and post-test environmental literacy scores of students in the experimental and control groups were examined in terms of mean, median, mode, standard deviation, skewness, and kurtosis. These analyses were used to evaluate the distributional characteristics of the data and to obtain preliminary information regarding the assumptions of parametric analyses. To examine the change in the environmental literacy levels of students in the experimental group before and after the intervention, a paired-samples *t* test was conducted. This analysis assessed the effect of the creative drama-based environmental education intervention on the environmental literacy levels of students in the experimental group through a pre-test–post-test comparison. To determine whether there was a significant difference in post-intervention environmental

literacy levels between the experimental and control groups, Analysis of Covariance (ANCOVA) was performed. In this analysis, the educational approach implemented (creative drama-based education vs. curriculum-based teacher-led education) was treated as the independent variable, and students' post-test environmental literacy scores were treated as the dependent variable. To control for potential differences arising from students' baseline environmental literacy levels, pre-test environmental literacy scores were included in the model as a covariate. By controlling pre-test scores as a covariate, the study aimed to more accurately evaluate the effect of the creative drama-based educational approach on students' post-test environmental literacy scores, independent of their initial levels. Accordingly, ANCOVA enabled the effect of the educational approach on environmental literacy to be isolated. Quantitative data were analyzed to address the research questions. The analyses were conducted using IBM SPSS Statistics 23.

Qualitative data obtained from the semi-structured interview forms were analyzed through thematic content analysis, which involves the processes of coding the data, identifying categories, and organizing these categories. The purpose of thematic content analysis is to reach concepts and relationships that can explain the collected data. Through thematic content analysis, the data are described and underlying meanings that may be embedded in the data are revealed (Yıldırım & Şimşek, 2016). In the thematic content analysis process of this study, an inductive approach was adopted. To enhance the reliability of the qualitative analysis, support was obtained from an experienced qualitative researcher who served as a second coder. The researcher and the second coder first conducted the analyses independently and then worked together to reach consensus regarding the identified codes and patterns. The reliability of the coding process in thematic content analysis was calculated using the formula proposed by Miles and Huberman (1994):  $\text{Reliability} = \text{Agreement} / (\text{Agreement} + \text{Disagreement}) \times 100$ . The coding reliability was found to be 89%. Reliability coefficients above 70% are considered acceptable for research purposes (Miles & Huberman, 1994).

#### *Reliability and Validity*

To ensure the reliability and validity of the data collection instruments, procedures appropriate to both the quantitative and qualitative phases of the study were followed. The Environmental Literacy Scale for Children, developed by Tabaru Örnek and Yel (2024), has established reliability coefficients reported by its developers. Cronbach's alpha values were .81 for the Political Behavior subscale, .75 for the Consumer and Persuasion Behavior subscale, .78 for the Eco-Management subscale, and .84 for the overall scale, indicating satisfactory internal consistency. For the qualitative component, the semi-structured interview form was developed by the researcher based on a review of the relevant literature and then examined by a primary school teacher, a faculty member with expertise in primary education, and a language expert. Revisions were made in line with expert feedback to enhance clarity and content relevance. The trustworthiness of the qualitative data analysis was supported through independent coding by the researcher and a second coder experienced in qualitative research. After coding separately, the researchers compared their analyses and reached consensus on codes and themes. Inter-coder reliability was calculated using the Miles and Huberman (1994) formula and was found to be 89%, which is considered acceptable for qualitative research.

#### *Ethical Considerations*

This study was conducted in accordance with the ethical principles and standards applicable to research involving human participants. Ethical approval was obtained from the Ordu University Educational Research Ethics Committee (Approval No: E-8666937-204.01.07-1233164). In addition, the necessary official permissions were secured from the Ministry of National Education to implement the study in schools. To protect participants' rights and confidentiality, all data were collected anonymously, and no information that could reveal participants' identities was recorded. Participation was entirely voluntary, and the purpose and scope of the study were clearly explained to the participants. They were assured that their responses would be kept confidential. Participants were also informed that they could withdraw from the study at any time without providing a reason and without facing any negative consequences. The research design and data collection procedures were carried out in accordance with national and international ethical standards.



## Research Result

### *Descriptive Results*

Environmental literacy pre-test and post-test scores for both groups were examined for normality. Descriptive statistics, including mean, standard deviation, Skewness, and Kurtosis values, were calculated prior to further analyses. The results are presented in Table 2.

**Table 2**

*Pre-Test and Post-Test Environmental Literacy Scores of the Experimental and Control Groups*

Group	Test	<i>M</i>	<i>SD</i>	Skewness	Kurtosis
Experimental	Pre-test	58.63	1.50	-1.11	1.47
	Post-test	60.83	2.59	0.88	1.30
Control	Pre-test	58.70	1.60	-0.99	0.03
	Post-test	58.57	1.61	-0.83	-0.70

Table 2 presents the descriptive statistics for the environmental literacy pre-test and post-test scores of students in experimental and control groups. The mean pre-test environmental literacy score of the experimental group was 58.63 ( $SD = 1.50$ ), while the mean pre-test score of the control group was 58.70 ( $SD = 1.60$ ). These values indicate that the two groups were highly similar in terms of environmental literacy levels prior to the intervention and were therefore comparable at baseline. Following the creative drama-based environmental education intervention, an increase was observed in the environmental literacy scores of the experimental group ( $M = 60.83$ ,  $SD = 2.59$ ), whereas the control group showed almost no change between pre-test and post-test scores (pre-test:  $M = 58.70$ ,  $SD = 1.60$ ; post-test:  $M = 58.57$ ,  $SD = 1.61$ ). An examination of skewness and kurtosis values indicated that the score distributions for both groups were within acceptable ranges for normality. Although minor deviations from normality were observed, particularly in the experimental group's post-test scores, these values remained within commonly accepted thresholds. Considering the sample size and the robustness of parametric statistical procedures to moderate violations of normality, parametric tests were deemed appropriate for subsequent analyses (Tabachnick & Fidell, 2011).

### *Effects of the Creative Drama Intervention on the Experimental Group*

The environmental literacy scores of the experimental group were compared before and after the intervention. For this purpose, the experimental group's pre-test and post-test environmental literacy scores were compared using a paired-samples *t* test. The results are presented in Table 3.

**Table 3**

*Comparison of the Experimental Group's Environmental Literacy Pre-Test and Post-Test Scores*

Test	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>
Pre-test	58.63	1.50				
Post-test	60.83	2.59	3.86	29	.001	0.70

As shown in Table 3, the experimental group's post-test environmental literacy scores ( $M = 60.83$ ,  $SD = 2.59$ ) were significantly higher than their pre-test scores ( $M = 58.63$ ,  $SD = 1.50$ ),  $t(29) = 3.86$ ,  $p = .001$ . The effect size was calculated as Cohen's  $d = 0.70$ , indicating a very large effect of the intervention on the experimental group.

### *Comparison of Experimental and Control Groups*

Post-test environmental literacy scores of the experimental and control groups were compared using ANCOVA while controlling for pre-test scores. The results are presented in Table 4.



**Table 4***Comparison of the Post-Test Environmental Literacy Scores of the Experimental and Control Groups*

Source	Sum of Squares	df	Mean Square	F	p	Partial $\eta^2$
Pre-test (covariate)	2.41	1	2.41	0.38	.541	.007
Group	102.53	1	102.53	16.29	< .001	.222
Error	358.48	57	6.29			

An analysis of covariance (ANCOVA) was conducted to examine the effect of the creative drama-based intervention on students' post-test environmental literacy scores while controlling for pre-test scores. The assumption of homogeneity of regression slopes was met, and the pre-test scores were included as a covariate in the model. The ANCOVA results indicated that the covariate (pre-test scores) did not have a statistically significant effect on post-test scores,  $F(1, 57) = 0.38$ ,  $p = .541$ . However, after controlling for pre-test scores, a statistically significant difference was found between the experimental and control groups in terms of post-test environmental literacy scores,  $F(1, 57) = 16.29$ ,  $p < .001$ , partial  $\eta^2 = .222$ . This result indicates that the creative drama-based educational intervention had a substantial effect on students' environmental literacy outcomes beyond initial group differences.

#### *Students' Views on the Creative Drama-Based Environmental Education*

Four main themes emerged from the qualitative analysis: (1) active participation in the learning process, (2) environmental awareness and empathy, (3) emotional experiences, and (4) transfer to everyday life. Representative student quotations are presented below.

#### Theme 1. Active Participation in the Learning Process

Students reported that the creative drama activities shifted their role in the lesson from listening to doing. Working in roles and in small groups appeared to keep more students involved at the same time and reduced moments of passivity. Participation was described not only as being more "active" in a physical sense but also as following the flow of the lesson more closely, anticipating what would happen next, and responding to peers during enactments. This structure seemed to distribute responsibility across the group, as each student had a part to carry out and a contribution to make. In this setting, engagement was sustained through interaction and shared tasks rather than teacher-led questioning alone. Students' accounts suggest that when they were expected to take on roles and act within a scene, they monitored one another's contributions and adjusted their own actions accordingly. As a result, participation was experienced as a collective process in which attention, involvement, and responsibility were shared. This pattern indicates that the drama-based format may have supported a more continuous and distributed form of classroom participation compared with lessons organized primarily around listening and responding. In this regard, some students emphasized that having everyone take on a role during the drama process fostered greater involvement in the lesson.

*"We didn't just listen in class; we also did things ourselves. Acting made the lesson more fun." (S3).*

*"Acting in the activities helped me understand the topic better, and it made me think about how I should behave outside school as well." (S4).*

*"Everyone did something—no one just sat around. That's why the lessons were really enjoyable..." (S7).*

The views expressed under this theme indicate that students perceived the drama activities as an opportunity for "learning by doing and experiencing," and that they felt classroom interaction increased throughout this process.

#### Theme 2. Environmental Awareness and the Development of Empathy

Students' accounts indicate that, during the creative drama process, environmental issues were not approached only as topics to be learned but as situations to be experienced from different viewpoints. By taking on the roles

of various living beings or elements of nature, students were encouraged to consider environmental problems from perspectives other than their own. Engaging with roles such as a tree or an animal appeared to make these issues more tangible and easier to grasp, while also prompting emotional responses that supported a sense of connection with the natural environment. In this way, the activities created space for students to interpret environmental situations in more personal and reflective ways rather than encountering them solely at the level of abstract information. Through this process, students stated that they became more aware of the consequences of environmentally harmful behaviors by enacting them, and that their thoughts about protecting the environment were strengthened.

*"When I played the role of a tree, I felt very sad when the tree was harmed. ..." (S2).*

*"When I became an animal in the activity, I understood how hard it is when their homes are destroyed. After that, I thought we should be more careful about protecting nature." (S8).*

*"...When I became an animal, I realized that nature needs us. Because being part of nature means being connected with it ..." (S10).*

Within this theme, the increase in students' environmental awareness appears to be closely related to the experiences they had through taking on different roles during the drama process.

### Theme 3. Emotional Experiences

Students reported experiencing a range of emotions during the creative drama activities and noted that these emotions influenced their overall learning experience. While some students highlighted the enjoyable aspects of the activities, others stated that they felt emotions such as sadness or anxiety when environmental problems were enacted. These emotional responses can be considered an important factor that made environmental issues more meaningful for students and contributed to increased attention and engagement with the topic. A closer look at students' descriptions of emotional engagement suggests that feelings experienced during role-playing sometimes translated into concrete intentions. For example, one student stated, "When I played the role of a tree, I felt very sad when the tree was harmed," while another noted that after the activity, "I thought about not wasting water at home anymore." These responses indicate that emotional experiences during enactment did not remain at the level of momentary feeling but were occasionally linked to reflections about everyday behavior. Such connections suggest that the emotional dimension of drama activities may have functioned as a mediating mechanism between classroom participation and emerging pro-environmental intentions, even if these intentions cannot yet be interpreted as long-term behavioral change.

*"Some games were really fun, but in some I felt sad. That was because we pollute the environment, knowingly or unknowingly." (S5).*

*"I thought that bad things would happen if we don't protect nature. That thought made me feel sad. Now I know that nature needs to be protected." (S9).*

*"During some activities I felt happy, but in others I felt sad because I realized how people harm nature without thinking. It made me understand that we should be more careful and protect the environment." (S11).*

The views grouped under this theme indicate that the creative drama process provided students with a learning environment that was not only cognitive in nature but also strongly affective.

### Theme 4. Transfer to Everyday Life

Students' views suggest that the creative drama-based environmental education process was not confined to classroom activities but was, in some cases, carried into students' everyday routines. They described paying more attention to their actions at home and at school and attempting to apply behaviors discussed during the lessons, such as being more careful about waste and resource use. These accounts point to small but noticeable shifts in awareness and intention, indicating that the learning experience occasionally extended beyond the classroom and informed how students thought about their daily practices. This is important, as it indicates that students were able to connect their environmental literacy gains with their daily practices.

*"I started separating the waste at home. Before, we used to throw everything into the same trash bin, but now I know that each one has its own place. This taught me to be more aware."* (S1).

*"After the activities, I began paying more attention to what I do at home. For example, I try not to throw garbage on the ground anymore and remind others to keep the environment clean."* (S6).

*"I try not to waste water. Because now I know that in the future we may need every single drop of water."* (S12).

Within this theme, students' ability to express environmentally responsible behaviors through concrete examples from their daily lives suggests that they found the intervention meaningful and applicable.

## Discussion

This study examined effects in environmental literacy between third-grade primary school students who participated in a creative drama-based environmental education intervention and those who received curriculum-based instruction, using a mixed-methods approach. Quantitative findings revealed a substantial increase in environmental literacy scores among students in the experimental group after the intervention and indicated that the experimental group achieved significantly higher post-test scores than the control group even after controlling pre-test scores (Table 3). Qualitative findings further showed that students perceived the creative drama process as a meaningful learning experience characterized by active participation, environmental awareness and empathy, emotional engagement, and transfer to everyday life. Taken together, these results suggest that creative drama offers a pedagogical approach to support environmental literacy within the context of primary science education (Aydın & Aykaç, 2016; Heikkinen, 2016). The findings are consistent with literature emphasizing that environmental literacy develops not only through environmental knowledge but also through multidimensional components such as attitudes, sensitivity, and tendencies toward responsible behavior. The limited change observed in the control group implies that environmental literacy in curriculum-based teacher-led education settings may often remain at the level of cognitive transmission, whereas creative drama-based practices may broaden the scope of learning by promoting more active student engagement (Toivanen et al., 2011). This aligns with perspectives arguing that environmental education at the primary level should not be restricted to the teaching of information alone. When interpreted through Mezirow's Transformative Learning Theory, the results indicate that the creative drama process provided a learning environment that supported key elements of transformative learning. In Mezirow's framework, learning involves questioning existing assumptions and developing more inclusive meaning perspectives (Brock, 2010). When interpreted through a transformative learning perspective, the findings of this study should be understood within the bounded context of this classroom-based intervention. Rather than indicating a fully developed transformative shift, the results point to early processes related to perspective-taking, emotional engagement, and emerging intentions toward environmental responsibility. In this sense, creative drama activities appeared to create conditions that supported reflective engagement and the reconsideration of existing viewpoints, particularly at the level of perspective-taking and intention formation. These processes may represent initial steps in meaning-making rather than long-term or fully consolidated transformation. By taking on different roles and acting out environmental situations, students engaged with environmental issues in a more concrete and personal way rather than encountering them only as abstract information. Several students described how embodying non-human perspectives shaped their thinking. For example, one student noted, "When I played the role of a tree, I felt very sad when the tree was harmed." Experiences of this kind appeared to help students consider environmental issues from viewpoints different from their own and to reflect on them more personally. In this sense, the drama activities created opportunities for the kinds of perspective-taking and reflection that are often associated with aligning with learning processes.

The active participation theme emerging from the qualitative findings highlights that the creative drama process enabled students to share responsibility for learning and increased classroom interaction. This is consistent with perspectives suggesting that learning is not solely an individual internal process, but can also develop through dialogue, collaboration, and social interaction. One student remarked, "Everyone did something—no one just sat around," indicating that the lessons were experienced as active and shared rather than primarily teacher-directed. In primary science classrooms, environmental topics can sometimes feel distant or abstract for young learners. The use of drama activities seemed to make these topics more concrete, as students engaged with ideas through role-taking and enactment. This kind of participation may have helped them relate environmental concepts to situations they could more easily understand (Sunasee et al., 2012). The emotional experiences theme is particularly noteworthy in providing the critical role of the affective dimension in the development of environmental

literacy. Students' reports of experiencing enjoyment alongside emotions such as sadness and anxiety suggest that drama-based environmental education can transform environmental issues from topics that merely need to be learned into personally meaningful experiences (Donmuş & Pepeler, 2016). Such processes of emotional connection may function as an important mechanism supporting the development of ecological responsibility and intentions to act. When the qualitative themes are considered together, a relational pattern becomes visible among active participation, emotional engagement, empathy, and transfer to everyday life. Students' active involvement in role-taking and enactment appears to have created emotionally meaningful learning experiences, which in turn supported the development of empathy toward living beings and environmental systems. These affective experiences seem to function as a mediating mechanism that connects classroom participation with students' willingness to translate learning into everyday environmental behaviors. From a transformative learning perspective, this progression can be interpreted as a movement from experiential engagement to reflective meaning-making and, ultimately, to shifts in students' perspectives and intentions regarding environmental responsibility. Rather than functioning as isolated outcomes, the themes identified in this study appear to interact as part of a broader meaning-making process through which students reinterpret their relationship with the environment. Finally, the transfer to everyday life theme strengthens one of the most central components of environmental literacy. Students' examples of behaviors such as recycling and conserving water indicate that learning extended beyond the classroom into daily life. From an environmental literacy perspective, the translation of learning into everyday practices can be interpreted as a significant indicator of developing pro-environmental behavioral intentions and a sense of responsibility. In this respect, the creative drama-based approach appears to have the potential to make environmental topics in primary science education more tangible, meaningful, and actionable for students (Özek, 2016).

The findings of the study also point to the importance of implementing creative drama-based environmental education in a planned and structured manner at the primary school level. In fostering multidimensional construction such as environmental literacy, the educational process should be designed not merely as the transmission of information, but as an experience that incorporates active participation, role-taking, empathy building, and connections to real-life contexts (McGonigal, 2005). In this regard, supporting environmental learning outcomes in primary science education through student-centered approaches such as creative drama may help extend environmental literacy beyond its cognitive dimension. Overall, this study provides preliminary evidence that creative drama-based environmental education can appear to support primary school students' environmental literacy, and that this observed gain is reflected not only in quantitative score gains but also in students' accounts of their experiences, emotions, and transfer of learning to everyday life.

## Conclusions and Implications

This study examined the extent to which participation in a creative drama-based environmental education intervention was associated with changes in third-grade primary school students' environmental literacy using a mixed-methods approach. Quantitative findings showed a significant increase in the experimental group's environmental literacy scores after the intervention and indicated that the experimental group achieved higher post-test scores than the control group even after controlling pre-test scores. Qualitative findings revealed that students perceived the creative drama process as a meaningful learning experience in terms of active participation, environmental awareness and empathy, emotional experiences, and transfer to everyday life. Taken together, these findings suggest that creative drama may serve as an alignment with a pedagogical approach that can support environmental literacy not only at the cognitive level but also through its affective and behavioral dimensions. When interpreted through Mezirow's transformative learning theory, creative drama activities appear to enable students to experience environmental issues from multiple perspectives, reflect on these experiences, and strengthen their sense of environmental responsibility. In this respect, creative drama can be considered a promising option for helping environmental education at the primary level move beyond information transmission and create more meaningful learning experiences.

From the perspective of science education, integrating creative drama-based activities into education aimed at enhancing environmental literacy may support students in concretizing environmental concepts and engaging actively in learning. Particularly given that environmental topics may remain abstract at the primary school level, drama techniques such as role-taking, enactment, and improvisation can help students make environmental problems more comprehensible and experiential. Therefore, it is recommended that primary science teachers plan creative drama activities in alignment with curricular objectives and support these activities with brief reflection and discussion sessions. In this way, students' environmental knowledge, attitudes, and pro-environmental behavioral

intentions can be addressed in a more holistic manner. Overall, the findings provide preliminary evidence that, within the bounded context of this single-classroom intervention, creative drama-based environmental education may support primary school students' environmental literacy across cognitive, affective, and experiential dimensions. Future research should conduct studies across different grade levels with longer interventions and retention measures to further strengthen the evidence regarding the effectiveness of creative drama-based environmental education.

### Limitations and Future Research

First, the study was conducted in a single public primary school and involved a relatively small sample of third-grade students taught by the same classroom teacher. Therefore, the findings should be interpreted within the specific socio-cultural and instructional context in which the study was carried out. The limited institutional and contextual diversity may restrict the transferability of the results to other regions, school types, and educational settings. Future research including larger and more diverse samples across different schools and socio-cultural contexts is needed to strengthen the external validity and generalizability of the findings. Second, the quantitative component employed a quasi-experimental design, and pre-test scores were controlled through ANCOVA in the between-group comparisons. In addition, the same teacher implemented education in both the experimental and control groups. Although this approach helped control differences in teacher quality and instructional style, it may also have introduced potential risks such as compensatory rivalry or differential instructional effort across groups. Variations in teacher enthusiasm, expectations, or interaction patterns may have influenced students' engagement and learning outcomes. Future studies could strengthen this line of research by involving more than one teacher, monitoring how the intervention is implemented in different classrooms, and documenting the instructional process in greater detail. At the same time, it should be acknowledged that classroom-based interventions are shaped by factors that are not easily controlled, such as differences in teaching style, classroom climate, students' prior experiences, and learning opportunities outside school. Replicating the intervention with different teachers and reporting classroom observations more systematically would therefore provide a clearer picture of how the process unfolds in practice. In addition, environmental literacy in this study was assessed through scale-based measures. While such instruments are useful for capturing key dimensions of environmental literacy, they may not fully reflect how students' environmentally responsible behaviors are maintained in everyday life contexts. In this regard, future research could incorporate retention measures, use behavior-based indicators (e.g., observations, student artifacts, family feedback), and examine students' environmental action processes in greater depth to provide a more comprehensive understanding of the nature of environmental literacy development. In addition, the study measured only immediate post-test effects following the intervention and did not include a delayed post-test or retention assessment. Therefore, it remains unclear whether the observed gains in environmental literacy were sustained over time. Future research should incorporate longitudinal follow-up measures to examine the durability of creative drama-based environmental education and to determine whether changes in attitudes and behavioral intentions are maintained in the longer term. Finally, the qualitative interviews were conducted only with students selected from the experimental group. Although this approach contributed to a deeper understanding of students' experiences, the qualitative findings may have limited representativeness for the entire sample. Future studies could diversify qualitative data sources by including teacher interviews and additional classroom process data, which may offer stronger explanations of the learning mechanisms through which creative drama supports environmental literacy.

### Declaration of Interest

The author declares no conflict of interest.

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## Appendix A

### Sample Items from the Semi-Structured Interview Form

The following sample questions illustrate the structure of the semi-structured interview form used in this study. The full interview protocol is available from the corresponding author upon reasonable request.

3. How did the creative drama activities influence your understanding of environmental issues?
7. Did the activities change how you think about protecting the environment? Please explain.

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